

Fall 2021 CHEM215-1

Course Objectives

Foundational concepts in organic chemistry will be introduced. Topics include nomenclature, structure and properties of common functional groups, acidity/basicity, conformational analysis, stereochemistry, and reactivity of organic compounds. The chemistry of hydrocarbons, alkyl halides, and alcohols, ethers, and carbonyl compounds will be included. Reaction mechanisms for organic transformations will be presented, and synthesis strategies will be covered.

Upon completion of the course students should be able to:

1. Identify and name important functional groups
2. Describe the three dimensional structures of the functional groups and relate structure and physical properties to specific electronic/orbital features
3. Depict structural dynamics based on conformational analysis
4. Predict the outcomes, including stereochemistry, of reactions involving the functional groups and rationalize these outcomes using a combination of arrow-pushing mechanisms, electronic and molecular orbital descriptions, and energy diagrams
5. Design short synthetic and retrosynthetic routes for the preparation of small organic molecules
6. Integrate spectroscopic techniques from the laboratory class

Instructor Information

Prof. Stephanie Knezz (she/her)

Assistant Professor of Instruction

Tech E213 (Just inside the Organic Lab doors)

stephanie.knezz@northwestern.edu

Office Hours: Monday 10:30-11:30 am; Thursday 11:30 am-12:30 pm and by appointment

Open Door Policy: If I am in my office and the door is open, you are welcome to stop by and ask questions. If I am not able to meet with you, I will close my door.

Course Modality

Class sessions for this course will occur in person. Individual students will not be granted permission to attend remotely except as the result of an Americans with Disabilities Act (ADA) accommodation as determined by AccessibleNU.

Weekly Schedule

Day	Monday	Tuesday	Wednesday	Thursday	Friday
What's going on?	Lecture in LR2 @ 8 am	Lecture in LR2 @ 8 am	Lecture in LR2 @ 8 am	Problem-solving in LR2 @ 8 am	Lab Lecture in LR2 @ 8 am
Okay, but what specifically?	Prof. Knezz is giving an interactive lecture	Prof. Knezz is giving an interactive lecture	Prof. Knezz is giving an interactive lecture	We're solving problems in groups or taking a quiz	Prof. Nelson is explaining the experiment for next week's lab.
And how do I prepare for that?	Review the previous lecture and read the textbook material.	Review the previous lecture and read the textbook material.	Review the previous lecture and read the textbook material.	Study for the quiz, and look at the problem set problems.	Look over the experiment details.

Schedule of Topics

Date	Topic	Assessment	Chapter (6th Edition)	Chapter (7th Edition)
Week 1	Chemical Bonding and Chemical Structure Fundamentals of Molecular Orbitals and Bonding Survey of Functional Groups Alkane structure and nomenclature		1-2	1-2
Week 2	Cycloalkanes, skeletal structures, substituents Alkane Physical properties Conformational analysis Lewis acid/base Electron-pair displacement and resonance electron movement	Quiz 1	2-3	2-3

Week 3	Acid-Base: Quantitative scales and structural trends Structural features of acidity Alkyl halide structure and nomenclature		3, 8	3, 8
Week 4	Synthesis (substitution/elimination reactions) Carbocation structure and reactivity Stereochemistry terms and definitions	Exam 1	9, 6	9, 6
Week 5	Stereochemical relationships between molecules Alkene/Alkyne structure and nomenclature	Quiz 2	6, 4, 14	6, 4
Week 6	Unsaturation number/stability Alkene addition reactions Ozonolysis		14, 4/5, 7	4, 5, 10, 7
Week 7	Reduction of alkynes Acidity of terminal alkynes Alcohols, ethers, and epoxides (synthesis & reactivity)	Quiz 3	14, 8, 10	10, 8, 11
Week 8	Oxidation and reduction reactions Synthesis of ethers/sulfides & epoxides	Exam 2	10-11	11-12
Week 9	Nucleophilic substitution of epoxides Oxidation of ethers and sulfides Aldehyde and ketone structure and nomenclature Physical properties of aldehydes and ketones Aldehyde and ketone reactions Basicity of aldehydes and ketones Reversible addition reactions		11, 19	12, 19

Week 10	Formation of organometallic reagents Nucleophilic addition reactions using organometallics Alkynes to organometallics & aldehydes and ketones Acetals and Protecting Groups Oxidation and reduction reactions		9, 19, 14	10, 19
Week 11	READING WEEK: REVIEW			

Course Materials

1. Title: Organic Chemistry, 7th or 6th Edition

Author: Loudon and Parise

Publisher: Macmillan

ISBN: 9781936221349

Approx. price: \$180 new, \$60 ebook rental

2. (Optional if not purchasing package) Title: Organic Chemistry Study Guide and Solutions Manual, 7th / 6th Edition

Author: Loudon and Parise

Publisher: Macmillan

ISBN: 9781936221868

Approx. price: \$100 new, \$45 ebook rental

Recommended:

1. (Optional if not purchasing the custom package)

Title: Organic Chemistry Study Guide and Solutions Manual, 7th / 6th Edition

Author: Loudon and Parise

Publisher: Macmillan

ISBN: 9781936221868

Approx. price: \$100 new, \$45 ebook rental

2. Molecular Modeling Kit (approx. \$20)

Evaluation

Midterm Examination (2 x 100 pts)	200 points
Final Examination	200 points
Quizzes (3 x 25 pts)	75 points
Concept Checks	25 points
Total	500 points

Exam Schedule

Midterm 1: Wednesday October 13th @ 7 pm

Midterm 2: Wednesday November 10th @ 7 pm

Final Exam: Monday, December 6th @ 7 pm

Concept Checks

Each lecture, there will be a short 1-point concept check quiz, with some content questions and a “Muddiest Point” question to assess understanding.

The total number of “concept check” points will be 25 points, but you will have more than 25 chances to earn those points. Once you reach 25 points, you “max out”, but this also means that if you miss a quiz or get a question wrong, you will have more chances to earn your points.

Office Hours

Your lab and lecture TAs will have weekly office hours in the Organic Tutor Room (just inside the Organic Labs, across from Prof. Knezz’s office). They will be in touch with you to schedule these office hours and a schedule will be posted on Canvas.

What type of thing can a TA or Professor help you with at an office hour or individual meeting?

1. Clarify topics you read in the book or heard about in lecture
2. Help you get on the right track with homework problems or lab questions
3. Find resources for extra practice problems

Communicating with the Instructors

We are all happy to meet with you and discuss questions about any aspect of the course.

Please be considerate of everyone’s time and consult the syllabus, Canvas postings, and any other communication from your teaching assistant (TA), the program assistant (Robin Stark) or Prof. Knezz before asking a question via email.

Prof. Knezz will communicate with you primarily through Canvas, but she promises not to spam you with a million Canvas notifications. In Canvas, go to *Settings > Notification Preferences* and set all to *ASAP* so that you do not miss any time-sensitive information about the course.

ASLA Resources

Quarter-Long Study Group Opportunity – Registration Required:

If you would like to study with other students in this class, consider joining a [Peer-Guided Study Group](#). Participants will meet weekly with about 5 to 8 other students and a peer facilitator, a student who has already taken and done well in the course. During sessions, students review concepts, work through practice problems, bring their questions, and work together to develop answers.

Students register for the full quarter on CAESAR and attendance is expected weekly. Study Group sessions are listed on CAESAR below course lecture and discussion sections (ex. CHEM 151-SG – CHEM 151-SG Peer-Guided Study Group: Quantitative Problem Solving in Chemistry). Feel free to contact Borislava at borislava.miltcheva@northwestern.edu with any questions. Provided through [Academic Support & Learning Advancement](#).

Drop-In Peer Tutoring – No Appointment Needed:

Students are welcome to stop by [Drop-In Peer Tutoring](#) to get support with a specific question or issue, or just talk through course materials with others. Covers this course and many introductory courses in Biology, Chemistry, Economics, Engineering, Math, Physics and Stats. Tutoring takes place Sundays through Thursdays. **Check specific times, courses and locations on the [Drop-In Peer Tutoring website](#)**. Feel free to contact Krystal at krystal.wilson@northwestern.edu with any questions. Provided through [Academic Support & Learning Advancement](#).

Lecture Recording

This class or portions of this class will be recorded by the instructor for educational purposes. Your instructor will communicate how members of the class can access the recordings. Portions of the course that contain images, questions, or commentary/discussion by students will be edited out of any recordings that are saved beyond the current term.

Plagiarism and Academic Integrity

In this course, you are encouraged to interact with other students, but you must submit our own work. It is important that all students acquire key content, analytical, and writing skills for themselves. Your grade is based upon your on assessments and the quality of your written work.

While collaboration is encouraged and I love to hear that you are discussing chemistry concepts with your peers and learning communities, you should not discuss answers to specific questions with your fellow students, and your answers should never look similar enough to raise an eyebrow.

All submitted work should reflect ONLY your own work and analysis!



If we find the work you submitted is the result of someone else's analysis (or a combined effort of analysis), it will be considered an academic integrity violation.

Accessing another student's work (currently enrolled or previously enrolled in the class) will be considered an academic integrity violation, regardless of the circumstances.

Plagiarism, the unacknowledged appropriation of another person's words or ideas, is a serious academic offense. It is imperative that you hand in work that is your own, and that cites or gives credit to others whenever you draw from their work.

Please see refer to [Northwestern University's Office of the Provost's Policy on Academic Integrity](#) and the [WCAS Student Handbook](#) for more information.

Additional information can be found below:

- Academic Integrity at Northwestern: <http://www.northwestern.edu/uacc/>
- Definitions of academic dishonesty: <http://www.northwestern.edu/uacc/defines.html>
- Due Process and Student Rights: <http://www.northwestern.edu/uacc/dueproc.html>
- What Happens If You Cheat: <http://www.northwestern.edu/uacc/whathapn.html>

Students must read and accept the terms related to academic integrity through the Quiz on Canvas before they are allowed to participate in the lab.

AccessibleNU: Students with Disabilities

In compliance with Northwestern University policy and equal access laws, Prof. Knezz and the TAs are committed to supporting the learning of all students. If you have already registered with the AccessibleNU Office and have your letter of accommodations, please meet with Prof. Knezz as soon as possible to discuss, plan, and implement your accommodations in the course. If you have or think you have a disability (learning, sensory, physical, chronic health, mental health or attentional) that isn't recorded by AccessibleNU yet, please contact the AccessibleNU Office (accessiblenu@northwestern.edu; 847-467-5530) for disability verification and for determination of reasonable academic accommodations. All information will remain confidential.

Except for unusual circumstances, requests for academic accommodations need to be made during the first week of the quarter so arrangements can be made. For more information, please visit: <http://www.northwestern.edu/accessiblenu/>

Course Philosophy

In Chem215, you will encounter chemical concepts that have been tested over years of observation and experiment. The reason there is a “right” and a “wrong” answer to your chemistry problems is that those answers have stood the test of time and repeated testing. At one point, however, some scientist made a prediction about something based on an observation. Over time, that scientist was proven wrong sometimes and proven correct other times. This is the progression of science.

Learning Objectives

By the end of this course, you will be able to:

- Identify and name important organic functional groups
- Describe the three dimensional structures of the functional groups and relate structure and physical properties to specific electronic/orbital features
- Predict the acidity/basicity of organic molecules and the product of proton exchanges based on functional group pKa
- Depict structural dynamics and energetics of organic molecules based on conformational analysis
- Predict the outcomes, including stereochemistry, of reactions categorized by functional groups and rationalize these outcomes using a combination of arrow-pushing mechanisms, electronic and molecular orbital descriptions, and energy diagrams
 - Functional groups explored include hydrocarbons, alkyl halides, alkenes, and alkynes
- Design short synthetic and retrosynthetic routes for the preparation of small organic molecules
- Integrate spectroscopic techniques from the laboratory class
- Apply the reasoning and analytical skills you have learned in this course to new situations, including other courses.

Statement of Inclusivity

This course strives to be an inclusive learning community, respecting those of differing backgrounds and beliefs. As a community, we aim to be respectful to all students in this class, regardless of race, ethnicity, socio-economic status, religion, gender identity or sexual orientation.

Gender Pronouns

This course affirms all gender expressions and gender identities. There will be a survey administered at the beginning of the quarter asking that you provide the name and pronouns that you use (which is entirely optional). This information will be given to your TA in their rosters. Prof. Knezz and your TA welcome you to correct us on your name or gender pronoun if a mistake is made. If you have concerns, please contact Prof. Knezz in person or by email, whatever is most comfortable for you.

Support for Wellness and Mental Health

Northwestern University is committed to supporting the wellness of our students. Student Affairs has multiple resources to support student wellness and mental health. If you are feeling distressed or overwhelmed, please reach out for help. Students can access confidential resources through the Counseling and Psychological Services (CAPS), Religious and Spiritual Life (RSL) and the Center for Awareness, Response and Education (CARE). Additional information on all of the resources mentioned above can be found here:

<https://www.northwestern.edu/counseling/>

<https://www.northwestern.edu/religious-life/>

<https://www.northwestern.edu/care/>

COVID-19 Classroom Expectations Statement

Students, faculty, and staff must comply with University expectations regarding appropriate classroom behavior, including those outlined below and in the [COVID-19 Code of Conduct](#). With respect to classroom procedures, this includes:

- Policies regarding masking and social distancing evolve as the public health situation changes. Students are responsible for understanding and complying with current masking, testing, Symptom Tracking, and social distancing requirements.
- In some classes, masking and/or social distancing may be required as a result of an Americans with Disabilities Act (ADA) accommodation for the instructor or a student in the class even when not generally required on campus. In such cases, the instructor will notify the class.
- No food is allowed inside classrooms. Drinks are permitted, but please keep your face covering on and use a straw.
- Faculty may assign seats in some classes to help facilitate contact tracing in the event that a student tests positive for COVID-19. Students must sit in their assigned seats.

If a student fails to comply with the [COVID-19 Code of Conduct](#) or other University expectations related to COVID-19, the instructor may ask the student to leave the class. The instructor is asked to report the incident to the Office of Community Standards for additional follow-up.